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The Inadequacies of Utility Theory from a Macroeconomic Modelling Perspective

Adam Kaczynski[1], James Juniper[2]

Abstract

The paper briefly draws on the work of Marx and Keynes to question the contribution that utility theory has made to Macroeconomics. Contemporary utility-theoretic developments (in Growth Theory and Behavioural Economics) are also examined from a Post-Keynesian, Macroeconomic-Modelling perspective and are found to be wanting. First and foremost, we discuss the implications of using representative agent models in a single good (i.e., corn model) context. In these "Robinson-Crusoe" models, the corn uneaten automatically becomes the seed corn planted in the ground and, through her choices, the consumer-farmer-investor implicitly determines the corn's own rate-of-return (interest rate) that ensures optimal production. As such, any departures from full utilisation of capacity and labour can only be the temporary result of optimal though costly processes of adjustment. Macroeconomic behaviour and outcomes that are still not adequately explained by more complex models include: (1) the existence of very high average propensities to save for wealthy households; (2) the phenomenon of liquidity preference, which explains the desire to hold money on the part of investors and determines short-run equilibrium in the market for both real and financial assets while providing a partial explanation for obstructions within the monetary circuit. In this context, it is argued that the process of expectations-formation is best seen as something that is fragile, contingent, and potentially subject to dramatic revision.

Keywords: Utility Theory, Liquidity Preference, Macroeconomic Modelling, Stock-Flow-Consistent Modelling

[1] Corresponding author, University of Newcastle , Email: adam_kaczynski@mailfence.com,
[2] University of Newcastle, Email: james.juniper@newcastle.edu.au

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1. Introduction

One of the axioms of mainstream economics states that human behaviour can be reduced by adjusting current and future consumption so that the marginal utility of consumption equals the marginal cost of obtaining goods and services. The allocation of disposable income between consumption and saving is explained by the maximisation of lifetime utility. Humans are also assumed to form correct rational expectations about the future, even in the presence of uncertainty. Some deviations from the rational lifetime utility maximisation behaviour are accepted and included in the models, but they are minor and do not invalidate the assumptions.

The purpose of this paper is to demonstrate that much of what passes for rational decision-making (including the high gross saving rate of the highest income group) cannot be readily explained within the neoclassical framework. In particular, the phenomenon of high average propensities to consume, which is of crucial importance for fiscal policy, seems to be inconsistent with the utility theory.

Alternatives to lifetime utility maximisation models of human behaviour are well known to social psychologists and sociologists, as mentioned by Gerhard, Gladstone and Hoffmann (2018). It has been observed that a significant number of individuals are driven by a separate goal; of accumulating wealth, which is achieved by saving (not consuming) a much higher fraction of the disposable income than what would be optimal from the point of view of maximising the lifetime utility, as defined in neoclassical theory. Wealth-hoarding behaviour is not irrational unless rationality is defined in the narrow sense used by mainstream economists as maximisation of utility only depending on consumption. For many individuals, the process of hoarding cannot be reduced to precautionary savings related to fundamental uncertainty. Some humans are obliged to accumulate wealth for the sake of accumulation. Moreover, the more the rich have, the higher the rate of accumulation is.

We are not claiming that this behaviour is always immoral or detrimental to the interests of the rest of society. It may be quite the opposite, depending on the social context. Deng Xiaoping famously said in 1986:

> So to get rich is no sin. However, what we mean by getting rich is different from what you mean. Wealth in a socialist society belongs to the people. To get rich in a socialist society means prosperity for the entire people. The principles of socialism are: first, development of production and second, common prosperity. We permit some people and some regions to become prosperous first for the purpose of achieving common prosperity faster. That is why our policy will not lead to polarisation, to a situation where the rich get richer while the poor get poorer. (As quoted by Whiteley, 2007).

What we want to highlight is that neoclassical economists do not understand correctly the social and psychological mechanisms leading to the accumulation of capital—they describe and build models of capitalism without capitalists.

Thus, the disconnect and conflict between mainstream economics and other social sciences (sociology and psychology) is not a result of different or contradictory research goals. It is caused by the universal acceptance of an axiomatic system of beliefs about the nature of human actions in mainstream economics. These beliefs have their roots in 18th-century utilitarianism and were further refined in the late 19th century. (Broome, 2015) This system of beliefs has profoundly affected the methodology used by economists, as explained by Nagatsu (2015). While the dogma of human rationality has been recently replaced by more realistic forms of behavioural economics, the dogma of utility maximisation as the driving force of human behaviour still remains in place.

As one of the work-horses of the mainstream "micro-foundations of macroeconomics", the humble utility function is dramatically modified to accommodate a wide range of choices, including those that are made between work and leisure, consumption and saving, and regarding the optimal allocation of savings across different classes of a financial asset. In a macroeconomic setting, neoclassical economists deploy the utility function: (1) in determining the trade-off between an increased purchase of goods and services and increased enjoyment of free time occasioned by a reduction of in working hours, on the one hand; (2) in determining the substitution between consumption today and deferred consumption at some time in the future; or, (3) in determining the flow of savings into different classes of both financial and non-financial assets.

In the second of these cases, a key role is played by elasticities of inter-temporal substitution derived from the utility function, where the target outcome is an integral of a discounted stream of current and future utilities. Decision-makers are either conceived as finite individuals, exercising consumption smoothing behaviour over their anticipated life cycles, while allowing for bequests made to subsequent generations, or as optimising, but infinitely-lived, 'dynasties'.

In the third case, utility maximisation drives a portfolio-allocation process. Individual investor-consumers will be prepared to pay more for assets that generate returns that are negatively correlated with fluctuations in consumption (and thus utility) at the margin and will need to be coaxed into investing in assets that generate positively correlated returns.

Because it is difficult to conceive of a way to specify a utility function that could simultaneously accommodate all of these cases, in practice, separation theorems are called upon so that one set of decisions can be isolated from the other (i.e. decision about consumption and savings must come first before decisions are made about the allocation of savings across various assets). Decisions about investment are then made, given the impact of such allocations on the weighted marginal cost of capital.

In Keynes's analysis of short-run equilibrium in asset markets, it is assumed that decisions are predicated on an assessment of comparative *nominal* returns on one asset relative to another, with due attention paid to liquidity premia and to the changes in spot prices required to generate any

requisite capital gains (or losses) to compensate for (or detract from) expected relative shortfalls (or gains) in nominal returns.

This paper briefly draws on the work of Marx and Keynes to question the contribution that utility theory has made to Macroeconomics. Contemporary utility-theoretic developments (in Growth Theory and Behavioural Economics) are also examined from a Post-Keynesian, Macroeconomic-Modelling perspective and are found to be wanting.

2. Marx, Keynes and Bentham

From obviously divergent philosophical backgrounds and political allegiances, Marx and Keynes treated Jeremy Bentham's Utilitarianism with a certain degree of contempt. Keynes expressed his concerns in his reflective essay, "My Early Beliefs", (1938):

> We used to regard Christians as the enemy because they appeared as the representatives of tradition, convention and hocus-pocus. In truth, it was the Benthamite calculus, based on an over-valuation of the economic criterion, which was destroying the quality of the popular ideal. (Keynes, 1938)

Marx attacked Bentham for his lack of originality and for ignoring the effect of history and culture on what passes for utility:

> The principle of utility was no discovery of Bentham. He simply reproduced in his own untalented way what Helvetius and other Frenchmen had said so spiritedly in the 18th century. To know what is useful, say, for a dog, one must study dog-nature. This nature itself is not to be deduced from the principle of utility. Applying this to man, he that would criticise all human acts, movements, relations, etc., by the "principle of utility" must first deal with human nature as modified in each historical epoch. (Marx, 1887, Chapter 24, Section 5, The So-Called Labour Fund; fn. 50).

In *The Jewish Question* Marx observes that doctrines of rights are promoted by the bourgeoisie as if they were universal interests. Nevertheless, he realised that 'the right of man to the property is the right to enjoy his possessions and dispose of the same arbitrarily without regard for other men, independent of society, the right of selfishness'. (Marx, 1844, cited by Corradetti, 2014).

A pertinent discussion of historical changes in consumption and saving behaviour can be found in Volume 1 of *Capital*, at the point where Marx (Chapter 24, section 3) describes four periods in the development of industrial capital. In the first period, when manufacturers were obliged to work hard for their livelihood: "They enriched themselves chiefly by robbing the parents, whose children were bound as apprentices to them; the parents paid a high premium, while the apprentices were starved". In the second period, "… they had begun to acquire little fortunes, but worked as hard as before" and attempted to live "in as plain a manner as before". With the third period, "when luxury began, and the trade was pushed by sending out riders for orders into every market town in the Kingdom" these same traders "had got money beforehand and began to build modern brick houses, instead of those of wood and plaster". The fourth period, "in which expense and luxury have made great progress, and was supported by a trade extended by means of riders and factors through every part of Europe". Marx goes on to observe that,

> All the conditions for carrying on the labour process are suddenly converted into so many acts of abstinence on the part of the capitalist. If the corn is not all eaten, but part of it also sown — abstinence of the capitalist. If the wine gets time to mature — abstinence of the capitalist. (Marx, 1887, Chapter 24, Section 3)

Marx then begins his famous proclamation:

> Accumulate, accumulate! That is Moses and the prophets! "Industry furnishes the material which saving accumulates." Therefore, save, save, i.e., reconvert the greatest possible portion of surplus-value or surplus-product into capital! Accumulation for accumulation's sake, production for production's sake: by this formula, classical economy expressed the historical mission of the bourgeoisie and did not form a single instant deceive itself over the birth-throes of wealth.

As Marx and Engels observed in Volume 1 of *Capital* (1887, Part VII, Chpt. 23, The Abstinence Theory):

> What in the miser is mere idiosyncrasy is, in the capitalist, the effect of a social mechanism in which he is but one of the wheels ... The development of capitalist production makes it constantly necessary to keep increasing the amount of capital laid out in a given industrial undertaking. Competition makes the immanent laws of capitalist production felt by each individual capitalist as external coercive laws. It compels him to keep constantly extending his capital in order to preserve it. But extend it he cannot, except by means of progressive accumulation. (Marx, 1887, Chapter 24, Section 5)

Marx (1887, Chapter 24, Section 5, The So-Called Labour Fund) also complained that Classical economists always loved to conceive of social capital as a fixed magnitude of a fixed degree of efficiency, "But this prejudice was first established as a dogma by the arch-Philistine, Jeremy Bentham, that insipid, pedantic, leather-tongued oracle of the ordinary bourgeois intelligence of the 19th century."

In this context, Marx (1887, Chapter 24, Section 5, The So-Called Labour Fund) also decried Bentham's dogma of conceiving of social capital "as a fixed magnitude of a fixed degree of efficiency"—a ruse that was deployed to justify the notion that, on the one hand, "the labourer has no right to interfere in the division of social wealth into means of enjoyment for the non-labourer and means of production", and

on the other hand, "only in favourable and exceptional cases, has he the power to enlarge the so-called labour fund at the expense of the 'revenue' of the wealthy."

3. Utility and Decision-Making

Mini insists that economic calculation is not the basis of Keynes' three psychological propensities, instead observing that the propensity to consume "is partly based on eight subjective motives of a sociological, psycho- logical, historical and even religious nature". Moreover, these motives that "vary enormously according to the institutions and organisations of the economic society which we presume, according to the habits formed by race, education, conventions, religion and current morals". (Mini, 1991, citing Keynes, 1973 (1936). *The General Theory of Employment, Interest and Money*, C. W., vol. VII: 107-9).

In accordance with this historicist approach to utility, which clearly mirrors that of Marx, Mini insists that "There is no need here to belabour the fact that Keynes viewed the Benthamite calculus as a fiction. All of chapter 12 of The General Theory, and his 1937 article in the Quarterly Journal of Economics, are devoted to show the lack of realism of the economic calculus with respect to estimating the future return of an investment."

The following quote from Keynes's 1937 QJE Essay highlights his concern about the probabilistic reasoning that is presumed to support the calculation of expected outcomes:

> [I]t was, I think, an ingredient in the complacency of the nineteenth century that, in their philosophical reflections on human behaviour, they accepted an extraordinary contraption of the Benthamite School, by which all possible consequences of alternative courses of action were supposed to have attached to them, first a number expressing their comparative advantage, and secondly another number expressing the probability of their following from the course of action in question; so that multiplying together the numbers attached to all the possible consequences of a given action and adding the results, we could discover what to do. In this way a mythical system of probable knowledge was employed to reduce the future to the same calculable status as the present. No one has ever acted on this theory. But even today I believe that our thought is sometimes influence by some such pseudo-rationalistic notions. (Winslow, 2005: citing Keynes, CW XIV: 124)

Mini (1991:463) also observes that Keynes's investment function does not depend on precise Benthamite calculation, "The interest rate is not the main determinant of investment, which largely depends on such abominations as "animal spirits," the nerves and hysterias and reactions to the weather of businessmen."

As to whether Marx applied similar calculative procedures as the Utilitarians in evaluating social outcomes, Brenkert (1975: 427) observes that "the only critical point is that the moral rightness or wrongness of actions cannot be determined solely by the value of the consequences." Marx never uses "the language of "maximisation." Instead calling, in more teleological terms, for "the full development of man as man—i.e. the complete fulfilment of man's "human nature."

For his part, Engels traces the problem at hand to an inversion of logic[3]:

> Bentham here makes the same error in his empiricism as Hegel made in his theory; he does not seriously try to overcome the contradictions, he turns the subject into the predicate, subordinates the whole to the part and in so doing stands everything on its head. First, he says that the general and individual interests are inseparable and then he stays unilaterally at the crudest individual interest. (Engels, 1975: 29)

4. Marx and Keynes—Questioning the Representative Agent Framework

This conception of a single representative consumer-producer-investor still features in highly aggregated macroeconomic models. One example of this arises when the Ramsey-Keynes growth model is incorporated into a macroeconomic IS-LM setting. It is well known that Frank Ramsey asked Keynes, himself, to provide a comprehensible economic interpretation of the Euler conditions associated with his intertemporal model of optimal growth. Nevertheless, Keynes realised that models of this kind, by automatically imposing the condition that "the corn uneaten becomes the seed corn planted in the ground", deny the core mechanism of *The General Theory* namely, effective demand. Keynes's rejection of this condition is clearly implied by the following quote:

> An act of individual saving means—so to speak—a decision not to have dinner today. But it does *not* necessitate a decision to have dinner or to buy a pair of boots a week hence or a year hence or to consume any specified thing at any specified date. Thus it depresses the business of preparing today's dinner without stimulating the business of making ready for some future act of consumption. It is not a substitution of future consumption-demand for present consumption-demand—it is a net diminution of such demand. Moreover, the expectation of future

[3] In his celebrated work of 'anatomo-politics', *Discipline and Punishment*, Foucault ridicules Bentham's obsession with his architectural design of a model prison—the infamous 'Panopticon', which he views as a 'diagram' of disciplinarity. However, Colin Tyler's (2003) paper focuses specifically on, while critically evaluating, Bentham's ontology (i.e., the 'Theory of Fictions'), which he himself viewed as an indispensable foundation for the implementation of his 'censorial utilitarianism'—entailing, as it does, the effective application by the authorities of a comprehensive calculus of pleasure and pain.

> consumption is so largely based on the current experience of present consumption that a reduction in the latter is likely to depress the former, with the result that the act of saving will not merely depress the price of consumption-goods and leave the marginal efficiency of existing capital unaffected, but may actually tend to depress the latter also. In this event, it may reduce present investment demand as well as present consumption-demand. [Keynes, 1936: Chapter 16, Section 1, p. 210]

Not only does this quote reject the notion that a deferment of consumption will automatically lead to an offsetting increase in investment spending, it also questions the capacity of optimistic expectations on the part of investors to prevent such a shortfall in effective demand. For his part, Marx (1894, Chp. 32) also questioned the relationship between savings and investment decisions:

> The last illusion of the capitalist system, that capital is the fruit of one's own labour and savings, is thereby destroyed. Not only does profit consist in the appropriation of other people's labour, but the capital, with which this labour of others is set in motion and exploited, consists of other people's property, which the money-capitalist places at the disposal of the industrial capitalists, and for which he, in turn, exploits the latter. (Marx, 1894, Chp. 32)

Marx comes to this view after tracing the complex evolution of the financial system, which expanded dramatically with the increase in the autonomy of commercial capital (mediating trade in commodities) and money-dealing capital (performing technical operations associated with monetary circulation) from industrial capital. Pari-passu with the development of credit money, activities such as the drawing and settling of accounts, the management of reserve funds and money-changing operations gradually extended into borrowing and lending operations and the management of interest-bearing capital, largely conducted by specialists within the banking system (Vasudevan, 2017). Accordingly, the money capital initiating the circuit of capital accumulation is no longer advanced by the capitalist but is borrowed from a system of financial capital, with other revenue streams (ground rent, income of unproductive classes, and some salaries) assuming the form of bank deposits. Moreover, the profits of the industry also become available for investment in other branches of economic activity.

Mainstream Theories of Consumption

Romer's textbook (2019) provides a detailed and rigorous explanation of several modern theories of consumption, providing microfoundations of modern neoclassical and New Keynesian models.

The Ramsey-Cass-Koopmans growth model provides the basic structure for all neoclassical and New Keynesian models. The behaviour of agents is described as solving a constrained maximisation problem. "The representative household wants to maximise its lifetime utility subject to its budget constraint." (Romer, 2019, p.55). It is assumed that agents have rational expectations (which reduces to perfect foresight in the simplest case). Their utility optimising behaviour is characterised by two parameters, the coefficient of relative risk aversion "θ", which defines the shape of the instantaneous utility function and the discount rate "ρ", determining the rate at which future consumption is discounted relative to current consumption. The standard way of solving a constrained maximisation problem is based on using the objective function and the budget constraint to set up a Lagrangian. The objective function is usually defined as the integral of the flow of the discounted utility over the whole infinite time period. First-order conditions (meaning that partial derivatives of the Lagrangian function are equal to zero) correspond to the stationary point of the Lagrangian. The system of equations defining the stationary point can then be solved to find the constrained maximum solution. The relative growth of consumption over time in equilibrium is described by an Euler equation, which is in general, an intertemporal form of a first-order condition on the evolution of an economic variable along an optimal path (Parker, 2007).

For the Ramsey model,

> "This condition states that consumption per worker is rising if the real return exceeds the rate at which the household discounts future consumption and is falling if the reverse holds. The smaller is θ, the less marginal utility changes as consumption changes, the larger are the changes in consumption in response to differences between the real interest rate and the discount rate." (Romer, 2019, p.58).

In this case, the resulting Euler equation defines the growth rate of marginal utility of consumption (the first partial derivative of utility) over consecutive periods. The marginal utility of consumption is an injective function of the rate of consumption. Accordingly, it is possible to calculate the average spending propensity by transforming the Euler equation.

The Permanent Income Hypothesis describes consumption behaviour under conditions of certainty. The lifetime utility of an individual who lives for a finite number of periods is maximised. Initial wealth and the pertinent labour income function are specified, and agents are assumed to be able to save and borrow at an exogenous interest rate. The budget constraint is defined by assuming that any outstanding debt has to be repaid by the individual before death (so that terminal net wealth has to be non-negative). This problem of utility maximisation under constraints can also be solved with a Langrangian. The first-order condition, so-defined, implies that the marginal utility of consumption is constant in every period. From this, it can be shown that consumption, itself, is constant. The interpretation of this statement is that the consumption of an individual is determined by the income over the entire lifetime (which is the permanent income as defined by Modigliani, Brumberg and Friedman). Romer (2019, p. 371) explains that "as long as the individual does not value saving in itself, the decision about the division of income between consumption and saving is driven by preferences between present and future consumption and information about future consumption prospects".

In his textbook, Romer (2019) mentions several theories describing the behaviour of rational utility-maximising economic agents dealing with uncertainty. Models based on these theories do not produce results related to saving behaviour which are significantly different from the baseline scenarios in which agents operate under certainty. An interesting deficiency of these neoclassical models, which incorporate risky assets, is the inability to explain the equity premium puzzle (why shares are much more profitable in the long run than government bonds).

Romer (2019) presents several trajectories that neoclassical economists pursued in their efforts to move beyond the permanent-income hypothesis. There is evidence suggesting that consumption *does* respond to predictable changes in income. Most households have little net wealth, and they consume a high fraction of the current disposable income. These households only have a small amount of savings which can act as a buffer to fund consumption if a sudden drop in disposable income occurs. A small fraction of households holds most of the wealth (assets) in society.

Neoclassical economists are mostly interested in explaining why low-income households save so little and have not developed quantitative models explaining why the richest have such a high average propensity to save. Romer (2019) mentions precautionary saving, liquidity constraints and departures from full optimisation as possible explanations of the social class-dependant saving behaviour described above.

Precautionary saving can be explained in the neoclassical models with uncertainty by assuming that utility is not quadratic (falls at a slower rate, and its third derivative is positive). Due to the non-linearity of marginal utility (the first derivative of utility is not linear), an increase in uncertainty raises the expected marginal utility for a given value of expected consumption and provides an incentive to save more. Assuming reasonable values of parameters, the expected rate of growth in consumption is increased by 2.5%.

Romer (2019) describes a method of simulating models with a precautionary-saving motive (with a non-quadratic utility function and uninsurable idiosyncratic risk) based on dynamic programming. The infinite-horizon problem is reduced to two periods. A value function is introduced in a Bellman equation. The value function satisfying the Bellman equation is then approximated numerically. The value of current consumption depends not only on the behavioural parameters of the household but the current level of resources (wealth). Households with low level of accumulated resources behave closer to "hand-to-mouth" while those with a higher level of accumulated resources behave more like "impatient permanent-income consumers".

Liquidity constraints can cause individuals to save more as insurance against the effects of future income falls. However, rich households face lower liquidity constraints, and it is they who save more, so this effect cannot be used to explain their relatively higher rate of saving.

Mainstream economists have also tried modifying the standard intertemporal utility maximisation framework by replacing completely optimising behaviour with heuristic decision-making rules, which is inspired by theories introduced by behavioural economists. The concept of utility maximisation as the engine driving human behaviour has not changed in these models. One of the attempts to improve mainstream models mentioned by Romer (2019), is the introduction of time-inconsistent preferences. These modifications allow models to better describe the behaviour of lower-income groups who are "impatient", as consumption is tracking changes in disposable income. Again, this approach does not solve the problem of correctly describing the behaviour of high-income groups.

5. Average saving propensity in heterogenous New Keynesian models

The evolution of New Keynesian models from RANK (representative-agent NK) towards the less aggregated TANK (two-agent) and fully disaggregated HANK (heterogenous-agent) models is described by Bilbiie (2020). The author acknowledges that a simple RANK produces results that are inconsistent with observations; the value of the fiscal multiplier is never greater than one. These results are not "Keynesian". Bilbiie demonstrates that a TANK or a HANK model can produce a more realistic aggregate expenditure function. Emphasis is put on the presence of hand-to-mouth households and self-insurance in the face of idiosyncratic shocks (unconstrained agents becoming liquidity constrained in the future). The issue of the anomalously high average saving propensity of high-income households is not addressed in the paper, but at least the spending multiplier (depending on the marginal spending propensity generated by the aggregate model) can be greater than one, once hand-to-mouth households are introduced. Bilbie shows that the determination of effective demand can be accomplished using what he calls a "New-Keynesian cross" diagram.

The average spending propensity is explicitly introduced in a New Keynesian framework by Aguiar, Bils and Boar (2020). Again, the main focus is on hand-to-mouth households. The authors state that they have found values of behavioural parameters ("β", the intertemporal discount factor and "σ", the intertemporal elasticity of substitution), explaining high values of marginal and average propensities to the spending of low-income households ("hand-to-mouth"). But in a New Keynesian framework, the same equations are also supposed to describe the behaviour of high-income households. Looking at the results of numerical simulations of average propensity to consume as a function of resources available to agents within one period, depicted in Figures A1 and A2, one can infer that only these households which have extremely low stock of accumulated wealth may save 25% of their disposable income. However, this is not consistent with the observation that high-income households are usually also the wealthiest, who derive a significant fraction of their income from investment (as shown in Table 1 and Table 2).

6. Estimating the average saving rate in Australia and the US

Gross saving is defined (Australian Bureau of Statistics, 2007) as the difference between gross disposable income and total final consumption expenditure. In net saving, net disposable income is used. Net disposable income is equal to gross disposable income minus depreciation (consumption of fixed capital). Gross saving rate is defined as the ratio of gross savings to gross disposable income.

In modern developed countries, the gross saving rate calculated for different income groups strongly depends on the value of disposable income earned by members of that group. This is supported by the data provided by the Australian Bureau of Statistics (2020), covering a "normal" period before the emergence of Covid-19 virus.

Table 1- Table 1. The average gross saving rate in Australia by income group, 2017-18

Equivalised Disposable Income Quintiles	Lowest	Second	Third	Fourth	Highest
Gross disposable income [$m]	93,330	144,032	193,459	253,837	487,026
Gross saving [$m]	-23,886	4,062	14,950	34,724	154,995
Average Saving Rate	-0.256	0.028	0.077	0.137	0.318

A negative saving rate of the lowest income group can be explained by the presence of pensioners and retirees, funding current consumption out of the accumulated savings. The highest income group has a very high average saving rate, about 32% of disposable income is saved.

Table 2- Table 2. The average gross saving rate in Australia by net wealth group, 2017-18

Equivalised Net Worth Quintiles	Lowest	Second	Third	Fourth	Highest
Gross disposable income [$m]	135,808	204,160	215,207	232,668	383,840
Gross saving [$m]	13,047	32,159	28,714	24,713	86,213
Average Saving Rate	0.096	0.158	0.133	0.106	0.225

A similar picture (the richest social group saves more) emerges when the average gross saving rate is calculated for net wealth groups. More detailed data for income groups within age groups is available for the United States from Consumer Expenditure Surveys. While the quality of the data related to the lowest and highest income groups is being questioned by Sabelhaus et al. (2015), there is no reason to assume that different age groups within the same income group have significantly different reporting habits.

Table 3- Average gross saving rate in the US by income group with income before taxes higher than USD 100k, 2018-19

Age of a reference person in a consumer unit	25-44	35-44	45-54	55-64	>65
Average income after taxes [USD]	128,479	152,437	156,565	160,163	155,963
Average annual expenditures [USD]	91,454	110,748	117,702	24,713	86,213
Average Saving Rate	0.288	0.273	0.248	0.271	0.319

It is evident that the average saving rate of an upper-class household does not depend strongly on the age of a reference person. High-income retirees do not dis-save; they keep accumulating wealth until they die. Lieberknecht and Vermeulen (2018) provide an independent estimation of the relative saving rate of different income groups in France and the US, by comparing wealth and income inequality. The results are consistent with the income survey data from Australia and the US, "over the last 100 years, the top 1% saves more than twice as much as the average, while the top 10% saves around 70% as much."

7. Portfolio-Allocation and the Investment Decision

Quite apart from any decision about how much to consume and how much to save, Keynes insisted that we must first explain why any investor would wish to hold money compared with other financial assets that promised higher returns:

> Why should anyone outside a lunatic asylum wish to use money as a store of wealth? "Because, partly on reasonable and partly on instinctive grounds, our desire to hold money as a store of wealth is a barometer of the degree of our distrust of our own calculations and conventions concerning the future. Even though this feeling about money is itself conventional or instinctive, it operates, so to speak, at a deeper level of our motivation. It takes charge at the moments when the higher, more precarious conventions have weakened. The possession of actual money lulls our disquietude, and the premium which we require to make us part with money is the measure of the degree of our disquietude. (Keynes, 1937, CW XIV: 116).

Drawing upon his general knowledge of psychoanalysis and fellow-Bloomsbury member Ernest Jones's theory of regression, Keynes (1928: 329) interpreted the 'love of money' as a possession that "will be recognised for what it is, a somewhat disgusting morbidity, one of those semi-criminal, semi-pathological propensities which one hands over with a shudder to the specialist in mental disease." Situates of financial crisis can turn more sublime motives of thrift and sacrifice into their more regressive counterparts.

In response, Keynes (1928: 331-32) urges us to return "to some of the most sure and certain principles of religion and traditional virtue—that avarice is a vice, that the exaction of usury is a misdemeanor, and the love of money is detestable, that those walk most truly in the paths of virtue and sane wisdom who take least thought for the morrow. "

Along similar lines, Marx observed (1887, Part II: The Transformation of Money into Capital, Chapter Four: The General Formula for Capital) that for the capitalist,

> The expansion of value, which is the objective basis or main-spring of the circulation M-C-M, becomes his subjective aim, and it is only in so far as the appropriation of ever more and more wealth in the abstract becomes the sole motive of his operations, that he functions as a capitalist, that is, as capital personified and endowed with consciousness and a will.

And on this view, he insisted that use-values should "therefore never be looked upon as the real aim of the capitalist", nor should the outcome be viewed as the result of any single transaction; for rather: The restless never-ending process of profit-making alone is what he aims at. This boundless greed after riches, this passionate chase after exchange-value is common to the capitalist and the miser; but while the miser is merely a capitalist gone mad, the capitalist is a rational miser.

We can thus conclude, that for both Marx and for Keynes (and in contrast to the assumption of mainstream representative agent models), the utility of deferred consumption has little to do with decisions about investment.

8. Contemporary Notions of Uncertainty Aversion

In this section of the paper, we want to link early discussions about uncertainty on the part of Keynes to contemporary notions. James Tobin's framework for asset-market equilibrium, where the demand for money, bonds and equities was conceived to be a function of own- and cross- rates of return (and where money paid a zero rate of interest), income and wealth, developed contemporaneously, and is designed to be compatible, with early versions of the capital asset pricing model. This remains true of subsequent work by Robert Merton and others, which was grounded in more mathematical analysis (i.e. advanced stochastic calculus and stochastic optimal control theory), but relied on inter-temporal utility theory as the major driver of asset prices.

Ironically, Yasuhiro Sakai (2018:15), following the lead of Brady (2004), insists that Keynes (1921) had already argued in favour of an interval-valued approach to probability theory. Sakai traces these arguments of Keynes in *A Treatise on Probability* to contemporary work on decision-making under uncertainty, which draws on potential theory and Choquet integration. To this end, he reproduces the following quote:

> The sphere of inexact numerical comparison is not quite so limited. Many probabilities, which are incapable of numerical measurement, can be placed nevertheless between numerical limits. And by taking particular non-numerical probabilities as standards a great number of comparisons or approximate measurements become possible." (Keynes, 1921, p.160)

He then cites the work of two Japanese economists as exemplars of this contemporary approach to the topic:

> Nishimura and Ozaki (2017), both ambitious Japanese mathematical economists, are among those people who have dared to make full use of Choquet integral and other highly advanced mathematical tools. (Sakai, 2018: 16).

In turn, Nishimura and Ozaki (2017: 77) cite the work of Dow and Werlang (1992), noting their application of Choquet integration to an explanation of the bid-ask spread in asset markets conceived as a manifestation of uncertainty aversion. In addition, the Japanese researchers draw on the analysis of who "introduce a non-linear valuation formula based on Choquet integrals of random payoffs to determine the selling and buying prices of securities that are set by dealers". Nishimura and Ozaki observe that armed with this machinery, Chateauneuf (1991) along with his fellow collaborators (Chateauneuf, Kast, & Lapied, 1996) investigate several pricing puzzles: "the premium that is paid for a short position, violation of put-call parity and the fact that the components of security —primes yielding the dividends plus the strike price at expiration) and scores (yielding the excess value to the strike price only)— can sell at a premium to the underlying security."

Another group of researchers who have developed and applied formal models of uncertainty aversion for two decades or more are the one-time real business cycle theorists Lars Hansen and Thomas Sargent and their associate Tallarini. Hansen and Sargent (2015) discuss two reasons for making this behavioural assumption. First, they note that it is difficult statistically to distinguish alternative models from samples of the sizes of typical macroeconomic data sets. Second, they acknowledge that experiments by Ellsberg (1961) make the no-model-doubts outcome implied by the Savage (1954) axioms *dubious*. As macro econometricians, they prefer to emphasise the first reason, which is formally implemented along the following lines:

> We construct bounds on value functions over all members of the decision maker's set of models. Min-max expected utility is our tool for constructing bounds on value functions. We formulate a two-player zero-sum game in which a minimising player chooses a probability distribution from a set of models and thereby helps a maximising player to compute bounds on value functions. (Hansen and Sargent, 2015: 2).

Here, the first player in the game, who chooses the 'worst-case' distribution, can be thought of as 'nature', the second player, then chooses the 'best-case' control law, given that nature is presumed to have already imposed the worst-case distribution, in 'full knowledge' of the make-up of the second players penalty function.

When this group of researchers they were met with doubt on the part of their elder mentor, Robert Lucas, whose preferred specification of preferences yielded an equity premium and market price of risk that was far too low when trying to account for a risk-free rate that would otherwise be far too high.

Their young collaborator, Tallarini, recommended the adoption of the preference specification of Kreps and Porteus (1978) and Epstein and Zin (1989), which separates risk-aversion from intertemporal substitution. In chapter 7 of their text, they interpret the key parameter, "θ", which is a transformation of a parameter measuring aversion to atemporal gambles, "as a Lagrange multiplier on the relative entropy constraint in constraint preferences and uses detection error probabilities to show that a moderate amount of concern about model misspecification under constraint preferences can substitute for the substantial risk aversion that provoked Lucas's dismissal of Tallarini's reworked computation of the welfare costs of business cycles." (Hansen and Sargent, 2015: 16).

Limitations of the New Behavioural Approach

From a modelling perspective the discriminating ability of these new 'behavioural' approaches is insufficient. On the one hand, this is because none of the above-mentioned models provides an answer to Keynes's problem—why anyone should wish to hold money. The use of money-in-utility functions is a desperate and ad-hoc remedy. On the other hand, the relevant parameters of uncertainty aversion are likely to vary considerably over the business cycle and possibly, over longer time horizons in ways that cannot be accounted for under the assumptions made about the nature of uncertainty aversion, especially if observation error and model uncertainty rather than just uncertainty about external sources of perturbation are acknowledged as potential sources of uncertainty (as in the typical robust control set up).

In a simplified and parsimonious setting (but one in which feedback is allowed to occur in a bidirectional manner, between financial markets, on the one hand, and product and factor markets, on the other hand), macroeconomic modellers will want to take trifold variations of this kind into account when developing scenarios for policy evaluation and calibrating and simulating the model. The key variables affected, associated decisions made, and characteristic transmission mechanisms will influence both the level, speed, and magnitude of shifts in such phenomena as the equity premium, wedges between nominal returns for bonds of different maturities, and rates of investment in non-financial assets.

9. Conclusion

From a macroeconomic perspective, the unified treatment of utility in the Ramsey-Keynes model represents an ideal of coherence (albeit one achieved at the expense of realism), which, for that very reason, is no longer attainable. In the original Robinson Crusoe-setting, the same utility function accounts for decisions about the trade-off between savings and consumption, optimal distribution of wealth over financial assets, and investment in productive capital. However, with efforts on the part of mainstream economists to account for each of these decisions in a more realistic manner (e.g. to explain such phenomena as 'keeping up with the Joneses', hand-to-mouth' consumption behaviour, decision making under uncertainty aversion, inter-related forms of quantity-constrained rationing, and investment behaviour conceived as a real option), utility-theoretic models have both diverged and proliferated to the point where it is impossible to combine each of their powers and insights into a coherent and consistent macroeconomic framework.

The idea of establishing rigorous and rational 'micro-foundations', which originally motivated Real Business Cycle models and New Keynesian experiments, has now collapsed under the weight of its own extravagant and exuberant outgrowths. On occasions when modellers attempt to impose an impossible coherence, no amount of parameter tweaking or manipulation will allow the models to capture real-world experience, so reluctant researchers are then obliged to curb their lofty ambitions, retreating to some ugly hybrid of the IS-LM variety.

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